(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau





(43) International Publication Date 26 July 2001 (26.07.2001)

PCT

(10) International Publication Number WO 01/054203 A3

(51) International Patent Classification⁷: H01L 31/0224, 21/768, 21/48, H05K 1/09

(21) International Application Number: PCT/US01/00430

(22) International Filing Date: 5 January 2001 (05.01.2001)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:
PCT/US00/01432 21 January 2000 (21.01.2000) US

(71) Applicant (for all designated States except US): MID-WEST RESEARCH INSTITUTE [US/US]; 425 Volker Boulevard, Kansas City, MO 64110 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SCHULZ, Douglas, L. [US/US]; 25 Sylvan Road, Billerica, MA 01821 (US).

CURTIS, Calvin, J. [US/US]; 1620 South Parfet Court, Lakewood, CO 80232 (US). GINLEY, David, S. [US/US]; 33630 Inverness Drive, Evergreen, CO 80439 (US).

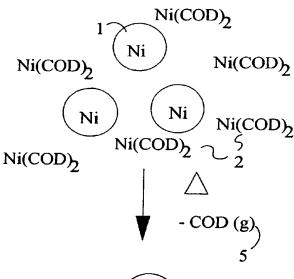
(74) Agent: WHITE, Paul, J.; National Renewable Energy Laboratory, 1617 Cole Boulevard, Golden, CO 80401 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

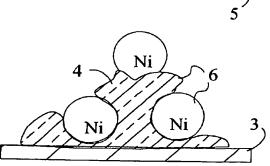
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: DIRECT PRINTING OF THIN-FILM CONDUCTORS USING METAL-CHELATE INKS



(57) Abstract: A process for forming an electrical conductor on a substrate is provided, consisting essentially of providing an ink comprised of a metallic chelate, printing directly thereon the ink, and decomposing the ink wherein the metal-chelate is converted to a solid metal conductor on the substrate.



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WO 01/054203 A3

WO 01/054203 A3



Published:

with international search report

(88) Date of publication of the international search report: 23 January 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

pal Application No

PCT/US 01/00430 A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L31/0224 H01L21/768 H01L21/48 H05K1/09 According to International Patent Classification (IPC) or to both national classification and IPC **B. FIELDS SEARCHED** Minimum documentation searched (classification system followed by classification symbols) IPC 7 H01L H05K Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, INSPEC, WPI Data C. DOCUMENTS CONSIDERED TO BE RELEVANT Citation of document, with indication, where appropriate, of the relevant passages Relevant to daim No. Х WO 99 19900 A (PATTERNING TECHNOLOGIES LTD 1-6,10; SPEAKMAN STUART (GB); THIN FILM TECHN) 12,13, 22 April 1999 (1999-04-22) 15,18 Υ page 5, line 29 -page 46, line 27 7,8,16, 23,24 γ US 4 599 277 A (BROWNLOW JAMES M ET AL) 7,8,16, 8 July 1986 (1986-07-08) 23,24 column 5, line 40 -column 8, line 13 US 5 882 722 A (KYDD PAUL H) Α 1-3,7, 16 March 1999 (1999-03-16) 10-12, cited in the application 14,15, 18,19, 22,23 column 6, line 31 -column 11, line 8 Further documents are listed in the continuation of box C. Χ Patent family members are listed in annex. Special categories of cited documents: *T* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the "A" document defining the general state of the art which is not considered to be of particular relevance invention *E* earlier document but published on or after the International "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) •Y' document of particular relevance; the claimed invention
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in the art. 'O' document referring to an oral disclosure, use, exhibition or *P* document published prior to the international filing date but later than the priority date claimed "&" document member of the same patent family Date of the actual completion of the international search Date of mailing of the international search report 10 July 2002 17/07/2002

Form PCT/ISA/210 (second sheet) (July 1992)

Name and mailing address of the ISA

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Internation No PCT/US 01/00430

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C.(Continua Category o	ation) DOCUMENTS CONSIDERED TO BE RELEVANT			
Jalegory -	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
A	TENG K F ET AL: "INK JET ASSISTED METALLIZATION FOR LOW COST FLAT PLATE SOLAR CELLS" PHOTOVOLTAIC SPECIALISTS CONFERENCE. NEW ORLEANS, MAY 4 - 8, 1987, NEW YORK, IEEE, US, vol. CONF. 19, 4 May 1987 (1987-05-04), pages 1430-1434, XP000078989 the whole document	1,2,7, 11,12, 15,20, 22,23		
Ą	TENG K F ET AL: "APPLICATION OF INK JET TECHNOLOGY ON PHOTOVOLTAIC METALLIZATION" IEEE ELECTRON DEVICE LETTERS, IEEE INC. NEW YORK, US, vol. 9, no. 11, 1 November 1988 (1988-11-01), pages 591-593, XP000066587 ISSN: 0741-3106 cited in the application the whole document	1,2,7, 11,12, 15,20, 22,23		
	HYBERTSON B M ET AL: "DEPOSITION OF PALLADIUM FILMS BY A NOVEL SUPERCRITICAL FLUID TRANSPORT-CHEMICAL DEPOSITION PROCESS" MATERIALS RESEARCH BULLETIN, ELSEVIER SCIENCE PUBLISHING, NEW YORK, US, vol. 26, no. 11, 1 November 1991 (1991-11-01), pages 1127-1133, XP000235263 ISSN: 0025-5408 the whole document	1,8,12, 15,16, 23,24		

INTERNATIONAL SEARCH REPORT

Information on patent family members

Internation No PCT/US 01/00430

Patent document cited in search report		Publication date	Patent family member(s)		Publication date	
WO 9919900	A	22-04-1999	GB	2330451 A	21-04-1999	
			GB	2330331 A	21-04-1999	
			AU	9451098 A	03-05-1999	
			CA	2306384 A1	22-04-1999	
			EP	1027723 A2	16-08-2000	
			WO	9919900 A2	22-04-1999	
			GB	2369087 A	22-05-2002	
US 4599277	A	08-07-1986	DE	3581158 D1	07-02-1991	
			ΕP	0177772 A2	16-04-1986	
			JP	1012672 B	01-03-1989	
			JP	1526137 C	30-10-1989	
			JP	61089839 A	08-05-1986	
US 5882722		16-03-1999	US	6036889 A	14-03-2000	

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